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In the Specification:

Page 1, paragraph (0002), amend to read as follows:

-- [0002] this application is a Continuation-In-Part of U.S. Application No.

a1 09/464,668 filed December 15, 1999, now Patent No. 6,457,347, issued October 1, 2002,
and entitled "Glow Discharge Detector." --

Page 1, paragraph (0003), amend to read as follows:

a2 -- [0003] The present invention relates to the measurement of trace elements in a gas, particularly to the measurement of trace elements in He carrier gas of a hand-held gas chromatograph, and more particularly to a more stable glow discharge detector using a floating pseudo-electrode for measuring trace elements of the He carrier gas, the more stable glow discharge being controlled through a biased resistor, and thus constitutes an improvement over the glow discharge detector of above reference Application S.N. 09/464,668, now Patent No. 6,457,347.

Page 2, paragraph (0005), amend to read as follows:

a3 -- [0005] In normal ion cells, ions are generated by either radioactive isotopes, such as nickel 63, or pulsed arc sources. The percentage of ions of the trace elements generated is dependent upon their operational modes. In an electron capture mode of operation, almost all the trace element molecules are ionized by capturing electrons. However, the mode of operation is limited to the cases where trace element molecules have electron negativity. In an ionization mode of operation, only a small portion of trace element molecules are ionized. The total amount of trace element ions is certainly dependent upon the available sample volume. In a portable GC, the available sample volume is generally quite small, on the order of micro-liters. For low concentration trace elements, the signal generated through direct electron measurement is quite small and may well be below the sensitivity of existing electron instruments. Except for more

costly optical detection methods, all the prior ion cells are not applicable to small sample size in the portable GC for general applications. --

(b) [Pages 2 and 3, paragraph (0006), amend to read as follows:]

-- [0006] Recent progress in micro-machining technology has enabled the development of miniaturized gas chromatography (GC) systems with micromachined fluidics and detectors, as exemplified by U.S. Patent No. 5,583,281 issued December 10, 1996 to C.M Yu. However, the sensitivity of these early micro GC systems was well below that of conventional systems due to limitations of the micro thermal conductivity detectors (TCD) used in most of the micro GS systems. Thus, efforts were directed to the development of a highly sensitive micro GC detector, which could replace the TCD in most portable GC systems and which has a potential to outperform some conventional GC detectors, such as the commonly used flame ionization detector (FID), nitrogen-phosphorous detector (NPD), and electron capture detector (ECD). These prior conventionally used high performance GC detectors are also sophisticated, heavy, large and require either make-up and detector gases and/or radioactive materials to operate, and they are not suitable for field applications where portability is a top priority. --

[Page 3, paragraph (0007), amend to read as follows:]

-- [0007] A TCD, on the other hand, employs thermal conductivity differences in various gas species to sense the change in gas composition. Although a TCD lacks sensitivity when compared with a FID, NPD and ECD, it is a much simpler detector and is much easier to be adapted for field use. Such are exemplified in U.S. Patent No. 5,591,896 issued January 7, 1997, to G. Lin, and in P. Dai et al, A Novel High Sensitivity Micro GC Detector, Transducers 99, June 7-10, 1999, pp. 696-699, Sandai, Japan. These sensors have two electrodes mounted along a single axis on a base substrate, and the

(13) cancel

two electrodes are separated by a narrow gap. One of the electrodes is tapered into a fine apex to create a strong concentration of electric field around the apex. When electric potential imposed upon the electrodes is sufficiently high, the gas molecules around the apex will be ionized. The ions and electrons generated by the ionization create an electric current flowing between the two electrodes across the gap. The electric current changes when gas composition changes because different gas molecules have different molecular structure and consequently different ionization characteristics, and this change is used as the micro detector's sensing signal. Polarity of the micro sensor can be set with the tapered electrode as either a cathode or an anode. These detectors measure the ionization properties of the sample gas in the glow discharge. --

(14)

Page 4, paragraph (0010), amend to read as follows:

-- [0010] The present invention provides a solution to the above-mentioned problem by providing a highly sensitive electronic ion cell which utilizes direct current (DC) glow discharge for the measurement of trace elements, in a carrier gas, such as He. The more stable glow discharge detector of this invention, like that of Application S.N. 09/464,668, now Patent No. 6,457,347, involves a constant wave (CW) direct current glow discharge controlled through a biased resistor. The glow discharge detector utilizes an extra floating pseudo-electrode to form a capacitor at the cathode dark space to detect the trace elements. The voltage drop between the cathode and the pseudo-electrode varies due to trace amounts of chemical components. --

(15)

Page 5, paragraph (0016), (0017), and (0018), amend to read as follows:

-- [0016] Other objects and advantages of the present invention will become apparent from the following description and accompanying drawings. The present invention involves a more stable or improved glow discharge detector and like that of Application S.N. 09/464,668, now Patent No. 6,457,347, is particularly applicable for the

*As5
Conc'd*

measurement of trace elements in He carrier gas of a portable (hand-held) gas chromatograph. The stable glow discharge detector is of a direct current (DC), constant wave (CW) type and utilizes a floating pseudo-electrode to form a probe in the plasma. The probe enables direct measurement of the large variation of cathode drop voltage due to trace amounts of chemical components in the He carrier gas, which is many orders of magnitude larger than that caused by direct ionization or electron capture. --

C4

-- [0017] The accompanying drawings, which are incorporated into and form a part of the disclosure, illustrate an embodiment of the detector of Application S.N. 09/468,668, now Patent No. 6,457,347, and on embodiment of the invention and, together with the description, serve to explain the principles of the invention. --

-- [0018] Figure 1 is a partial cross-sectional view of an embodiment of a glow discharge detector of Application S.N. 09/464,668, now Patent No. 6,457,347. --

C1

Pages 5 and 6, paragraph (0021), amend to read as follows:

-- [0021] The present invention, like that of Application S.N. 09/464,668, now Patent No. 6,457,347, involves a highly sensitive electronic ion cell for the measurement of trace elements in a carrier gas, such as He, in a gas chromatograph (GC) which utilizes a direct current (DC), constant wave (CW) glow discharge controlled through a biased resistor. In the resistor controlled CW glow discharge, the change of electron density caused by chemical components in the He carrier gas is many orders of magnitude larger than that caused by direct ionization or electron capture. To directly measure the electron density in the plasma of a glow discharge an extra floating pseudo-electrode has been added to form a probe in the plasma. By using this probe, chemical components can be directly measured. --

A9

Pages 8 and 9, paragraph (0027), amend to read as follows:

-- [0027] As pointed out above, in a separation column of a GC, chemical trace elements are carried by a carrier gas and each separated into small gas plugs through interaction with the coating inside the column. As each plug of the trace chemical elements enters a glow discharge detector, because the molecules of these trace elements are different from those of the carrier gas in their electron affinity, molecules cross section and ionization potential, in first analysis, they certainly will cause the charge density in the bulk plasma of the glow discharge to vary. However, the charge density of a glow discharge is determined by external limitation. Any modification of the charge density in the bulk plasma by the trace elements must be instantaneously compensated by the internal field in the glow discharge detector (GDD). Variation of cathode drop voltage due to electrical current is logarithmically proportional to current. --

A9

Page 11, paragraph (0034), amend to read as follows:

-- [0034] Referring now to the drawings, Figure 1 illustrates in partial cross-section, the glow discharge detector made in accordance with above-referenced Application S.N. 09/464,668, now Patent No. 6,457,347. As shown, the detector, generally indicated at 10, comprises a glass tube 11 in which a pair of stainless steel or tungsten tubes 12 and 13 are coaxially mounted by a sealout, such as epoxy, indicated at 14 and 15. A tungsten member or pin 16 having a tapering end is coaxially mounted in stainless steel or tungsten tube 12 by the tube 12 being pinched as indicated at area 17, but such as to provide minimal blockage of gas flow through the detector. Glass tube 11 is mounted to a separation column of a GC whereby gas in the column passes therethrough as indicated by the gas in arrow and gas out arrow. --

(W10)
Page 11 and 12, paragraph (0036), amend to read as follows:

-- [0036] Case 1: In a helium gas with low concentration of sample gases, because of the low possibility of ionization, these sample molecules will inter-mix with the helium gas molecules and ions in the cathode dark space and causes a decrease of the value of the large electrolytic capacitance. To maintain the same value for the surface charge on the emission point, the value of the voltage drop across the cathode dark space will have to increase. By measuring this voltage drop as the sample gases pass by, one can monitor the variation of this voltage drop due to the low concentration of the sample gases. In this case, there is a negative signal. --

(W11)
[Page 12, paragraph (0037), amend to read as follows:]

-- [0037] Case 2: In a helium gas with high concentration of sample gases or sample gasses by their own, a part of the sample gases in this case will be ionized. The ionized sample molecules can increase the value of the large electrolytic capacitance in the cathode dark space. Therefore, it can lower the voltage drop across the cathode dark space. Then, in this case, there is a positive signal. --

Pages 12 and 13, paragraph (0039), amend to read as follows:

-- [0039] Figure 3 illustrates an embodiment of the improved or more stable glow discharge detector of the present invention. The Figure 3 embodiment differs from the Figure 1 embodiment by replacing the hollow tube anode 13 of Figure 1 with a solid rod anode made of refractory metals with low work functions such as, tungsten, molybdenum, uranium, platinum and etc., or normal metals like copper or gold which would not be poisoned by oxygen to achieve a more stable system for easier alignment. Components of Figure 3 corresponding to those of Figure 1 are given similar reference numerals. As seen in Figure 3, the solid rod anode 13' is supported within a tube 22

*(u11
cancel)*

that may be made of stainless steel, copper or preferably other refractory metals with low work functions such as, tungsten, molybdenum, uranium and etc., or normal metals like copper or gold which would not be poisoned by oxygen, via a pair of pinched areas 23 and 24 of tube 22, similar to pinched area 17 of Figure 1, or by separate support members, so as to provide minimal blockage of gas flow through the detector.

The electrical circuit of Figure 2 can be used for Figure 3 also. --

In the Claims:

Claim 4, amend to read as follows:

(u12 Sub po) 4. (Amended) The detector of Claim 3, wherein each of said member having a tapering end and said solid member is composed of tungsten.

Claims 5 and 6, cancel.

Claims 7, 8, 9, 11, 13, 14, 15 and 17, amend to read as follows:

(u13 Sub po) 7. (Amended) The detector of Claim 1, wherein said tapering end of said member is tapered to a point, and wherein said point is located closely adjacent to said solid member.

(u14 Sub po) 8. (Amended) The detector of Claim 1, additionally including an electrical circuit including a power supply, a capacitor, and a plurality of resistors.

9. (Amended) The detector of Claim 8, wherein said capacitor is electrically connected intermediate a pair of resistors.

11. (Amended) In a hand-held gas chromatograph, the improvement comprising:

a direct current, constant wave glow discharge detector,